

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,072,717 B1
APPLICATION NO. : 10/030830
DATED : July 4, 2006
INVENTOR(S) : Joe Wolf et al.


Page 1 of 8

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page should be deleted and substitute therefore the attached title page.
In the drawings, Sheet 1, Figure 1 is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 2, Figure 1A is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 3, Figure 2 is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 4, Figure 3A is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 4, Figure 3B is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 4, Figure 3C is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 4, Figure 3D is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 4, Figure 3E is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 5, Figure 4 is replaced with the Formal Drawing attached hereto.
In the drawings, Sheet 6, Figure 5 is replaced with the Formal Drawing attached hereto.

Signed and Sealed this

Third Day of April, 2007

A handwritten signature in black ink, reading "Jon W. Dudas". The signature is stylized, with a large, looped initial "J" and a distinct "D".

JON W. DUDAS
Director of the United States Patent and Trademark Office

(12) **United States Patent**
Wolf et al.

(10) Patent No.: **US 7,072,717 B1**
 (45) Date of Patent: **Jul. 4, 2006**

(54) **MULTIRATE COCHLEAR STIMULATION
 STRATEGY AND APPARATUS**

(75) Inventors: Joe Wolf, Coogee (AU); Paul Michael
 Carter, Carlingford (AU); Simon
 Geoffrey Parker, Ryde (AU); Robert
 Fearn, Maroubra (AU); Nild
 Frampton, Eastwood (AU)

(73) Assignee: Cochlear Limited, Lane Cove (AU)

(*) Notice: Subject to any disclaimer, the term of this
 patent is extended or adjusted under 35
 U.S.C. 154(b) by 618 days.

(21) Appl. No.: 10/030,830

(22) PCT Filed: Jul. 13, 2000

(86) PCT No.: PCT/AU00/00838

§ 371 (c)(1),
 (2), (4) Date: Jun. 5, 2002

(87) PCT Pub. No.: WO01/03622

PCT Pub. Date: Jan. 18, 2001

(30) Foreign Application Priority Data

Jul. 13, 1999 (AU) PQ1610

(51) Int. Cl.
 A61F 11/04 (2006.01)
 H04R 25/00 (2006.01)

(52) U.S. Cl. 607/57; 381/320

(58) Field of Classification Search 607/55-57,
 607/136, 137
 See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

4,357,497 A 11/1982 Hochmair et al.

4,400,590 A 8/1983 Michelson
 4,441,202 A * 4/1984 Tong et al. 381/326
 4,532,930 A 8/1985 Crosby et al.
 4,593,696 A * 6/1986 Hochmair et al. 607/57
 5,597,380 A * 1/1997 McDermott et al. 607/57
 5,601,617 A 2/1997 Loeb et al.
 5,749,912 A 5/1998 Zhang et al.
 5,800,475 A 9/1998 Jules
 6,289,247 B1 * 9/2001 Fakys et al. 607/57

OTHER PUBLICATIONS

PCT International Search Report for PCT/AU00/00838;
 filed Jul. 13, 2000; published Jan. 18, 2001 (WO 01/03622
 A1).

Technical Manual: The Laura Cochlear Prosthesis, Antwerp
 Bionic Systems, N.V., 1991.

Peeters, et al., The Laura Cochlear Implant Programmed
 with the Continuous Interleaved and Phase-Locked Continu-
 ous Interleaved Strategies, Cochlear Implants: New Perspec-
 tives, 1993.

Kong, Lei Wai, Psychophysical Studies Investigating a
 Place/Rate Speech Coding Strategy for a Multi-Electrode
 Cochlear Implant, University of Melbourne, Thesis, Jul.
 1990.

* cited by examiner

Primary Examiner—George Manuel

Assistant Examiner—Nicole R. Kramer

(74) Attorney, Agent, or Firm—Jagtiani + Guttag

(57) **ABSTRACT**

An improved processing approach is disclosed in order to
 allow for different rates of stimulation to be used for
 different electrodes in a multi-electrode cochlear implant.
 When the incoming signal is processed by filter array (35),
 each channel is processed to determine amplitude (37) and
 to estimate the period of the signal in that channel (39). The
 amplitude and period information is used to determine
 which electrode is stimulated, and the timing of that stimu-
 lation.

18 Claims, 6 Drawing Sheets

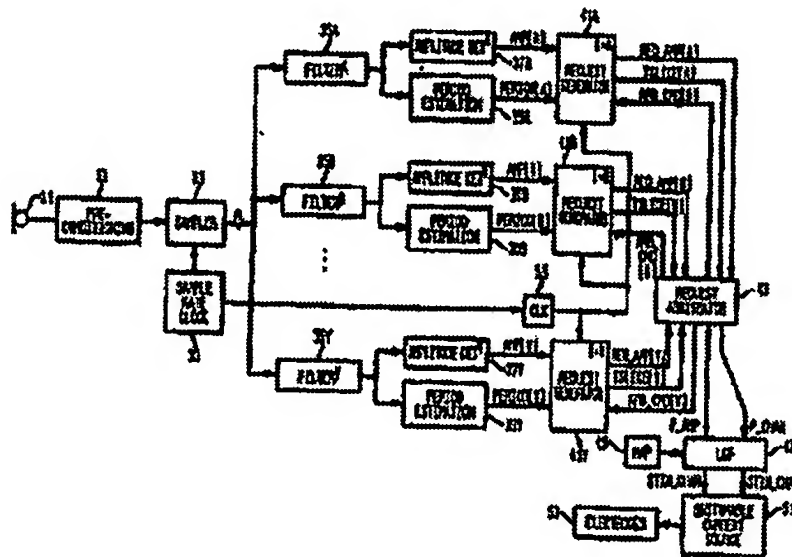


FIG. 1

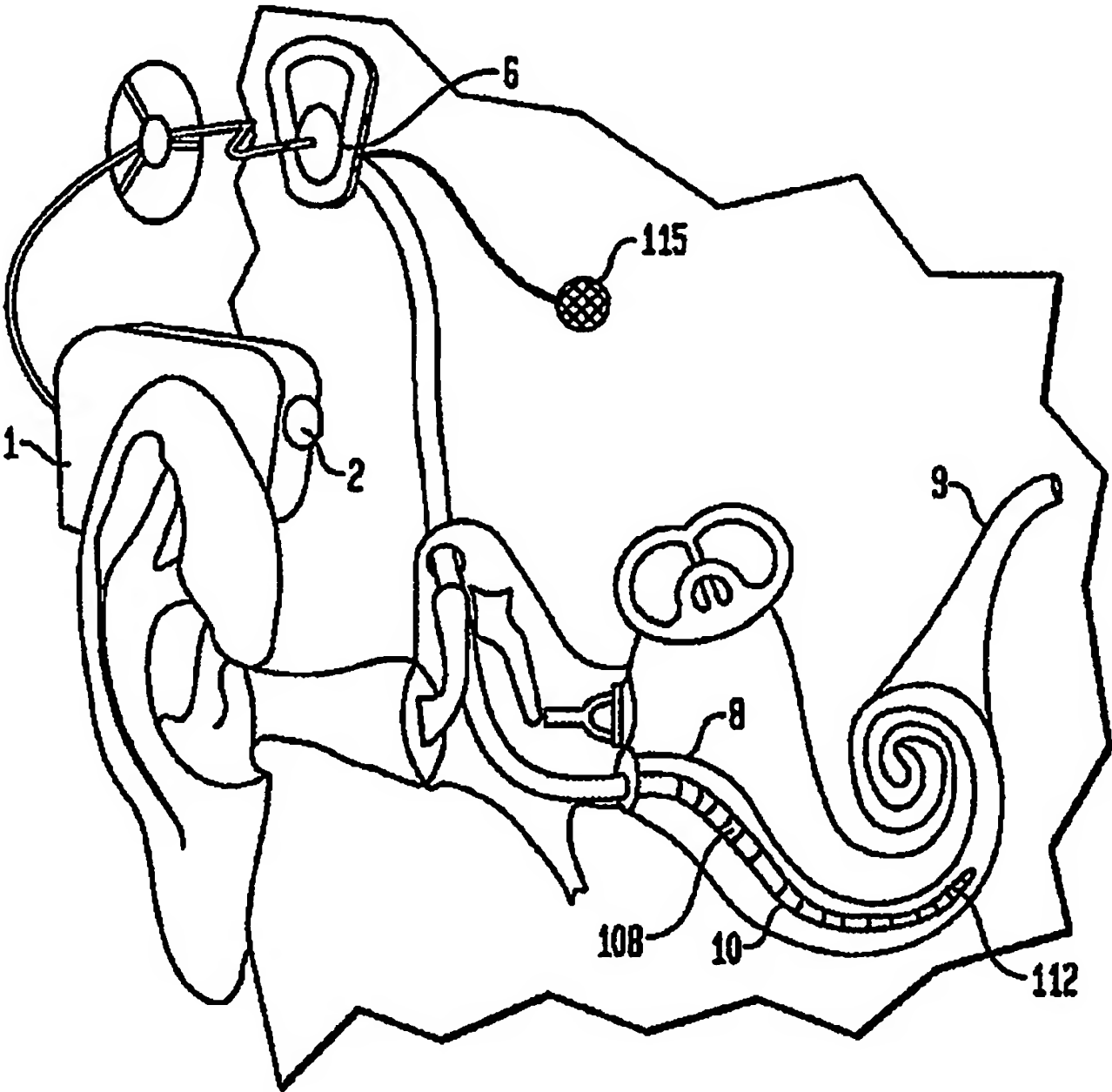
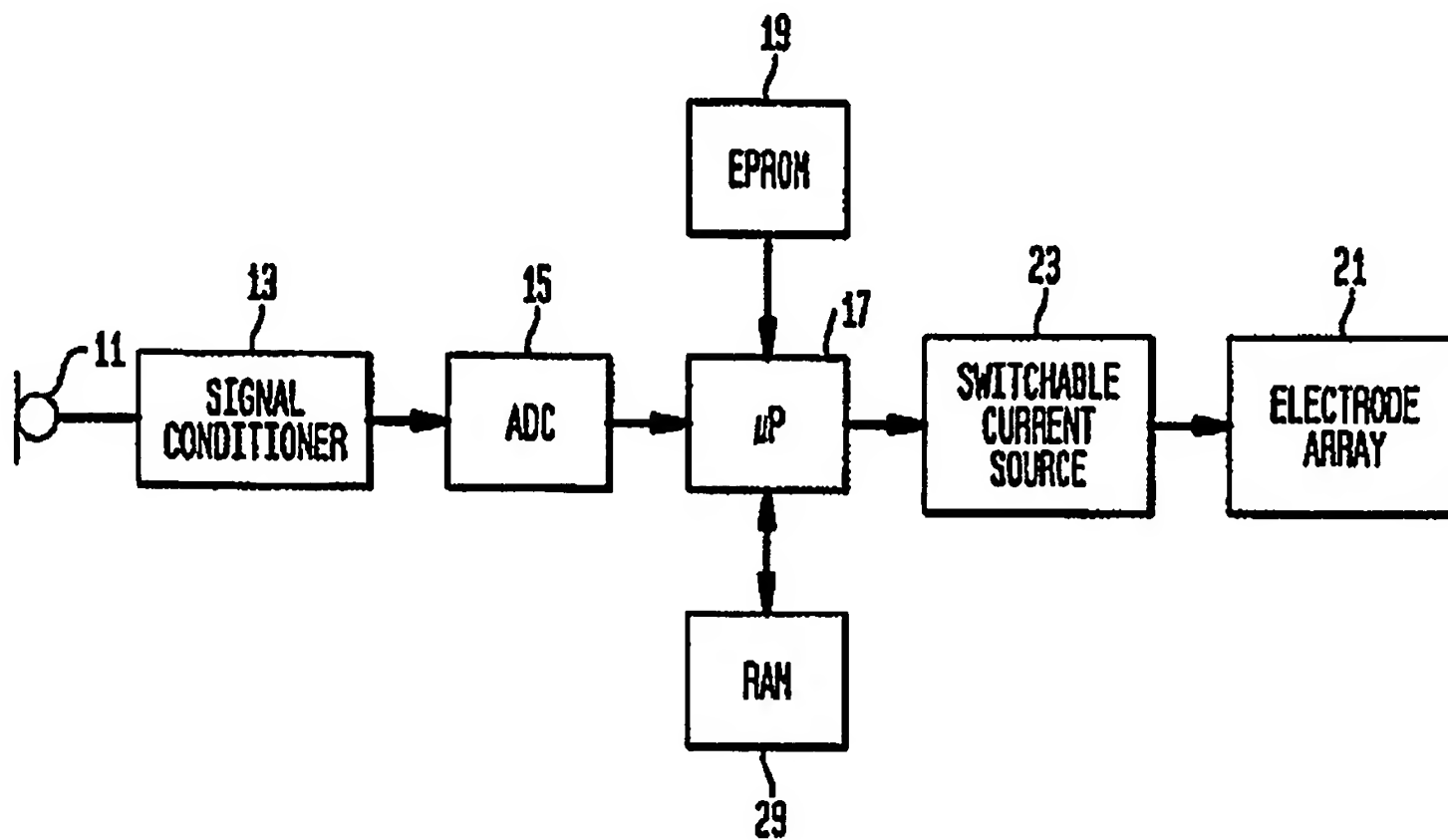


FIG. 1A

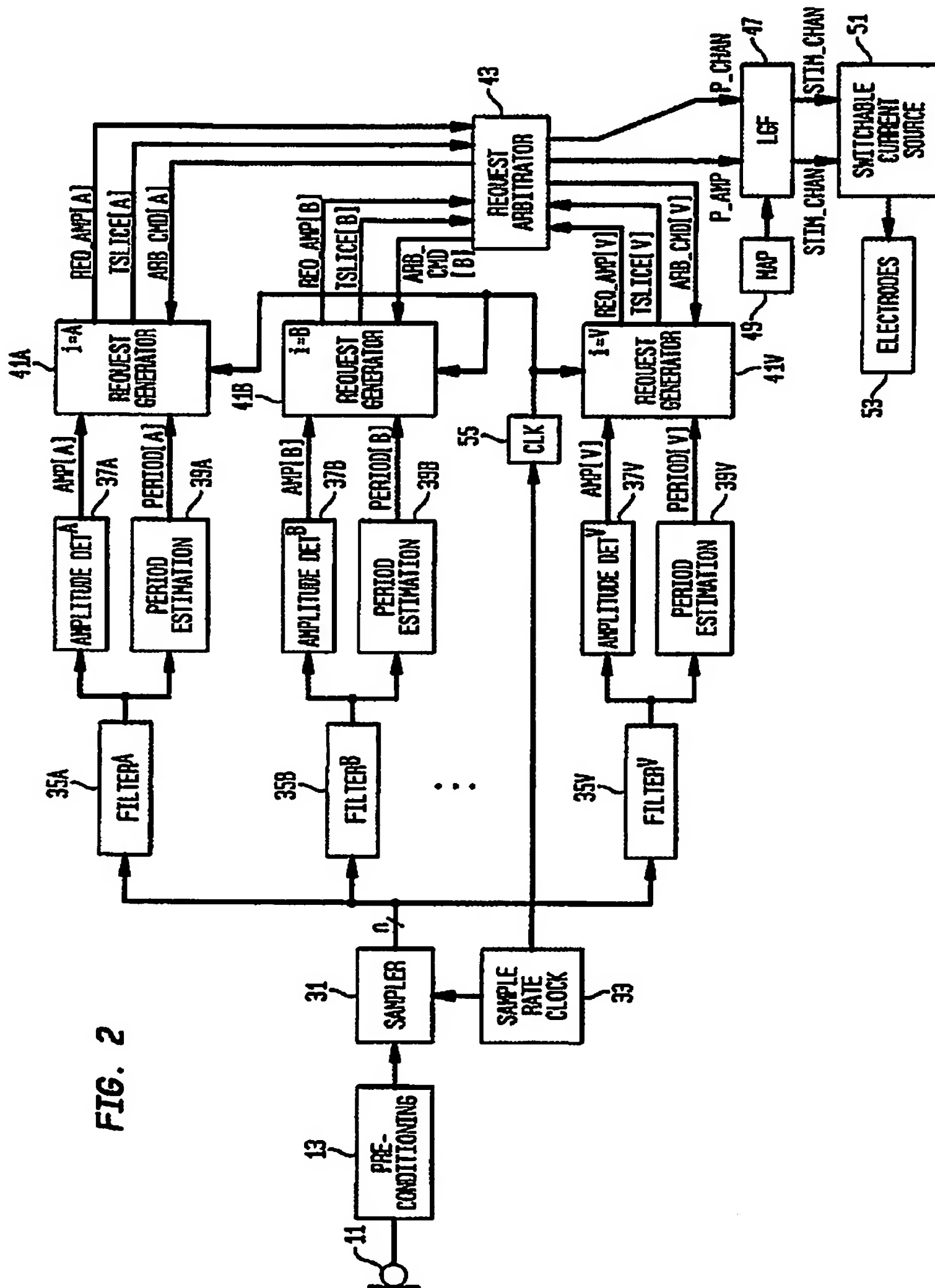


FIG. 3A

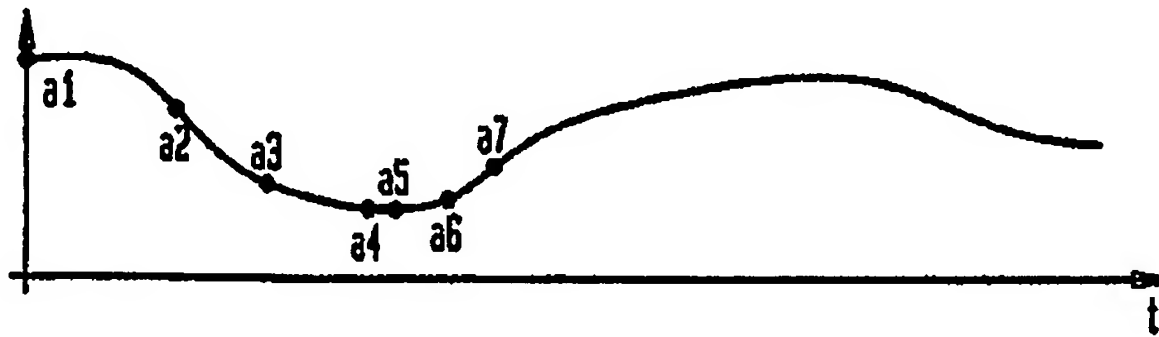


FIG. 3B

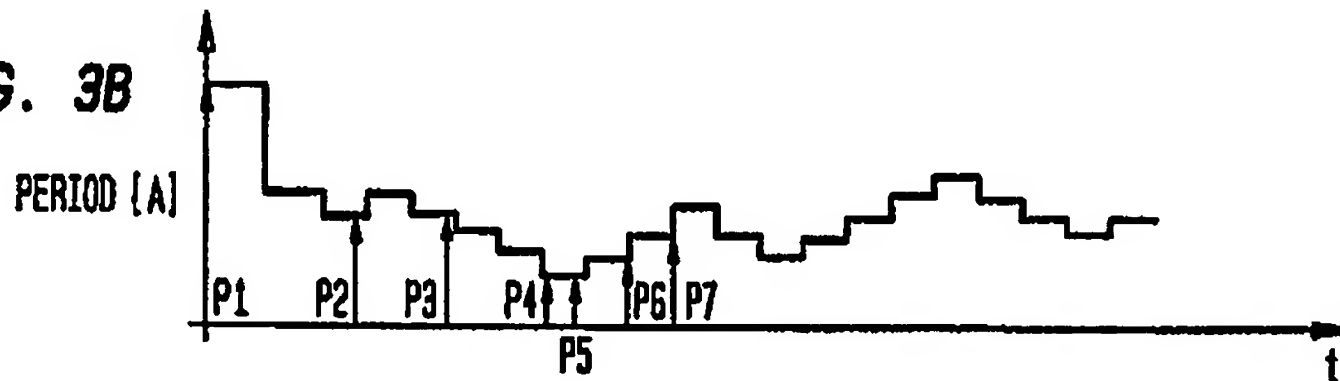


FIG. 3C

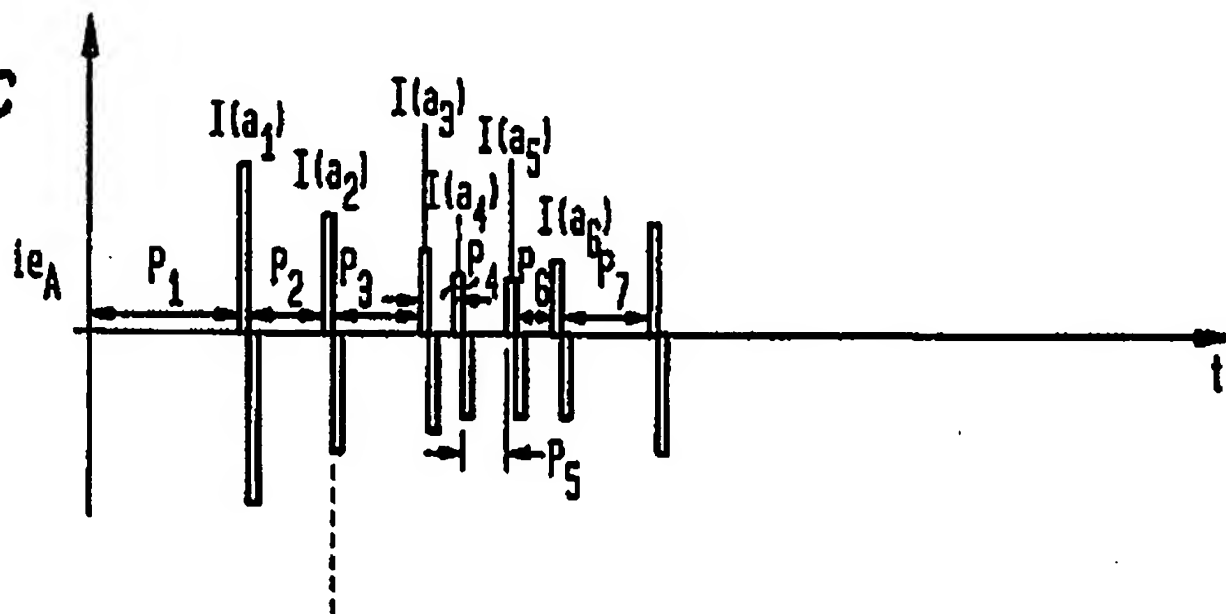


FIG. 3D

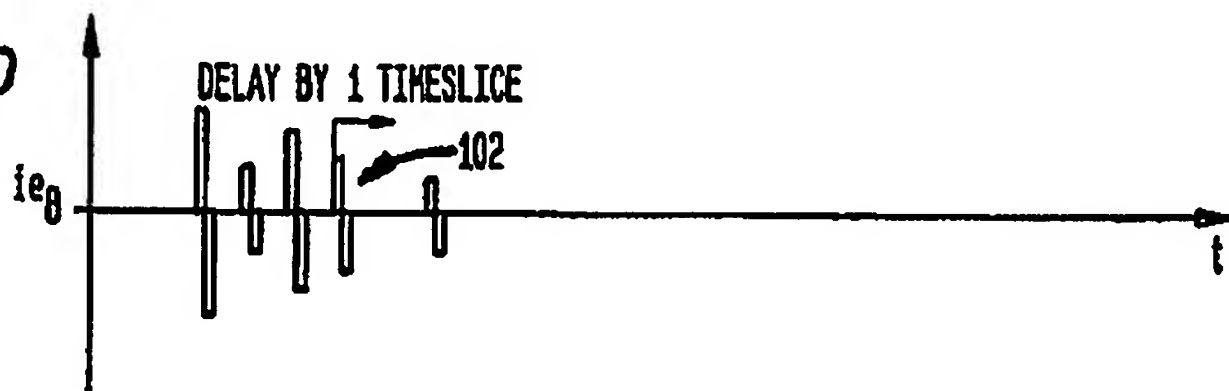


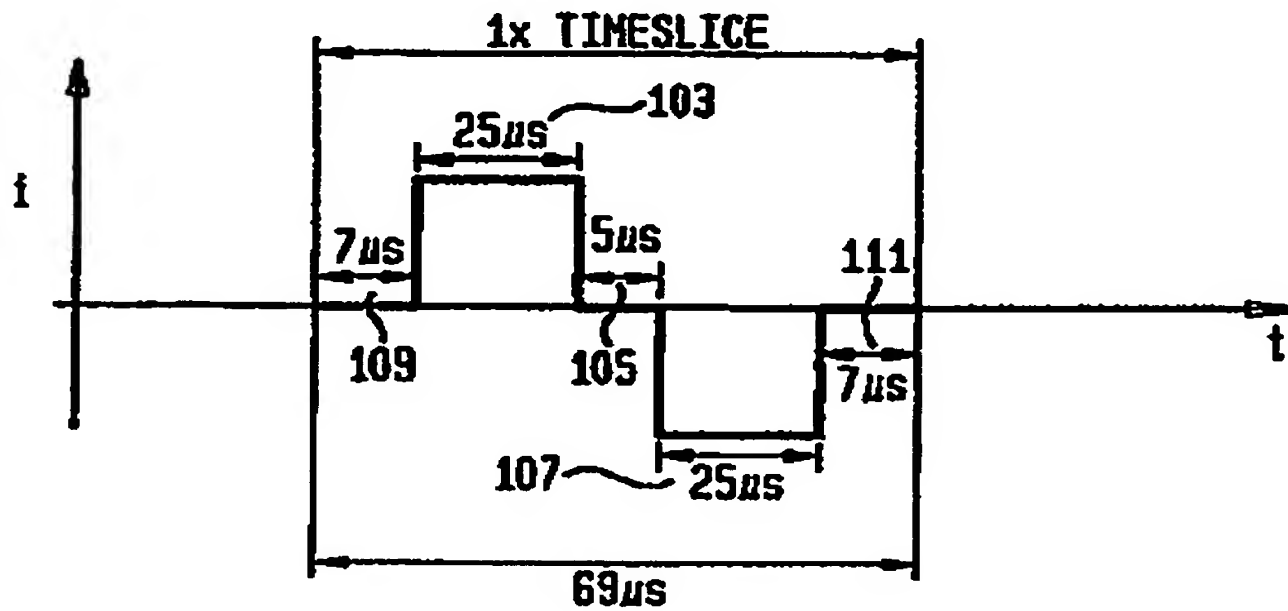
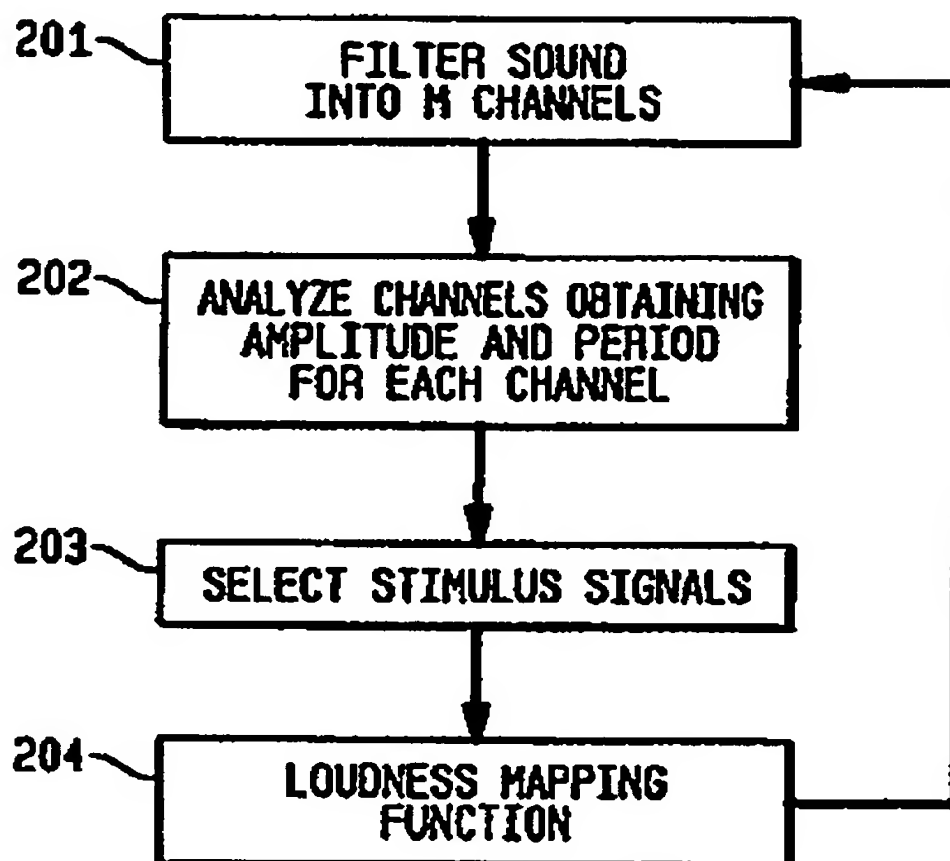
FIG. 3E**FIG. 4**

FIG. 5